

HIGHWAY SNOW PLOUGH MSP3703, MSP4003, MSP4603

MEIREN ENGINEERING OÜ

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USER MANUAL
2015

MEIREN^{SNOW}
Push your limits. Expand your boundaries.

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CE DECLARATION OF CONFORMITY

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We hereby declare that the below mentioned product

Highway snow plough

MEIREN^{SNOW} MSP

Model:

Serial number:

Manufacturing date:

meets the following directives and standards:

2006/42/EC
EN 349:1993+A1:2008

FOREWORD

We thank you for having chosen a Meiren Snow product. This operator manual consists of technical data, user and maintenance instructions and warranty conditions of MSP03 series snow ploughs. MSP03 series snow ploughs are designed for removing snow from surfaced roads. The product is not suitable for removing sand, gravel, ice or other similar material. Purposeless usage of the plough may cause economic losses and injuries. Thus it is of the utmost importance that the person operating the plough read through the manual and use the product pursuant to the requirements. Any misuse of the product releases the manufacturer from the liability for occurred damages and for reimbursing losses.

GENERAL SAFETY REQUIREMENTS

As the construction of the product is complex and it contains moving parts, it is of the utmost importance that the person working with the equipment be aware of all safety risks. To reduce the risks it is important that:

- the operator have read through the operator manual;
- the operator have been given an appropriate training, which gives him the permit to use a product of this type in his work;
- the operator have been provided with all necessary tools and is wearing suitable working clothes.

PERSONNEL

This product may only be used and maintained by properly trained personnel. The operator's employer is obliged to ensure fulfilment of all user instructions and safety requirements stipulated by the manufacturer.

Before starting working with the plough please be sure to read carefully through the operator's manual!

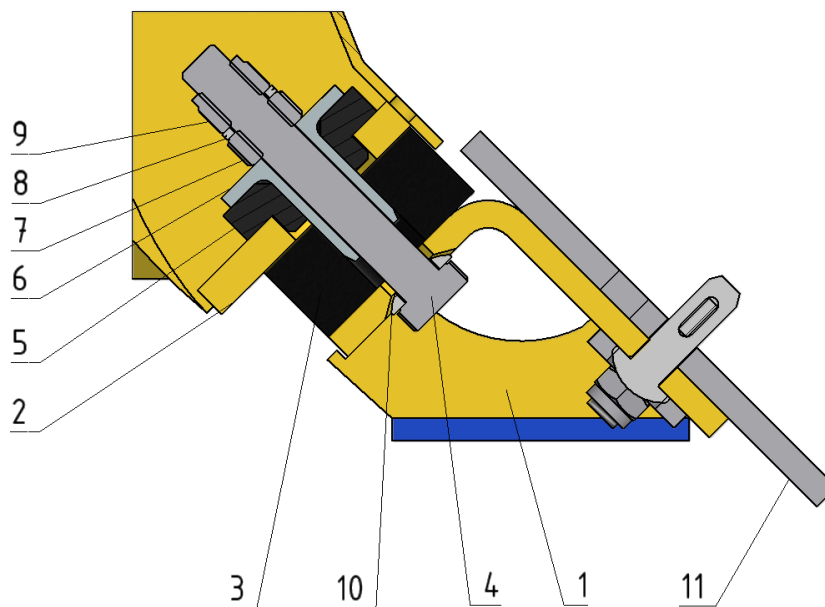
1. PRODUCT DESCRIPTION

MSP3703, MSP4003 and MSP4603 snow ploughs made of a reliable steel frame and provided with a plastic screen are designed for professional usage on surfaced highways. The tilt angle of the cutting edges of MSP03 series snow ploughs in relation to the ground is 45–50°. This ensures efficient removal of snow from the road. At a speed of 50 km/h snow is thrown to a maximum distance of 13 m. The optimum shape of the plough also ensures economic and smooth work at speeds up to 70 km/h. The benefits of a blade partially made of plastic compared to a steel blade are increased rust resistance, lower noise level and lighter weight. For plastic material we use a special frost and wear resistant plastic sheet with a thickness of 8 mm. Indices 3703, 4003 and 4603 used in the marking of the plough show the approximate total width of the cutting edge of the blade in millimetres.

The MSP03 series model is equipped with replaceable noise dampening blade holders (drawing 1). There is a special moulded rubber strap (3) between the blade holder (1) and mouldboard (2) the function of which is to reduce noise and to increase the flexibility of the cutting edge (11) in relation to the road surface. This in its turn improves the ploughing quality and reduces wearing of road markings. The blade holders are connected to the plough blade by means of fastening fixtures (4, 7, 8, and 9). A spherical shim (10) ensures flexible movement of the cutting edge holder. Steel-rubber bushings (5, 6) provided in the bolt openings prevent noise transfer to the blade via bolts.

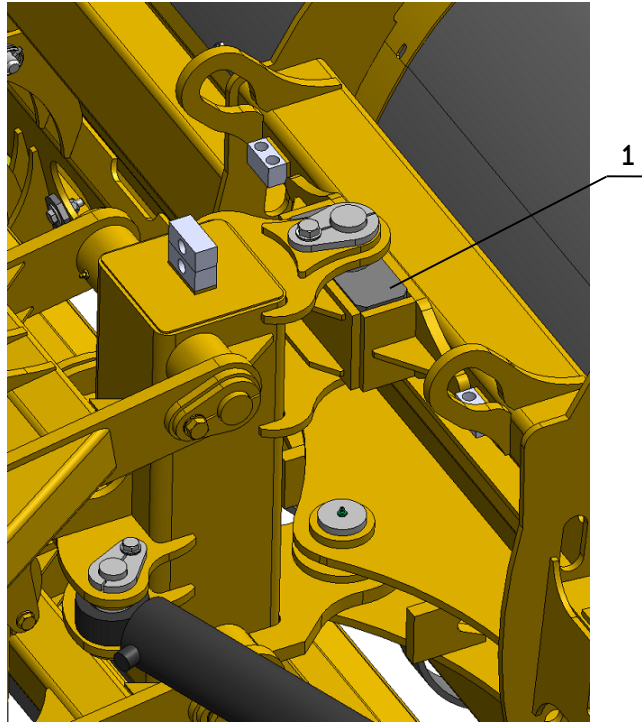
The joints of the lifting frame (parallelogram) on the vehicle side are equipped with rubber bushings to further reduce further noise and vibration transferred to the cabin.

The cutting edge is fastened on the blade holder in a usual way: either by wedge bolts or other bolts. To avoid wear of the blade holder in the event of excessive wear of the cutting edge, support plates made of wear resistant steel are installed under the blade holder, the function of which is to reduce wear of the blade holder (yet these are not meant to be used as a skid shoe).



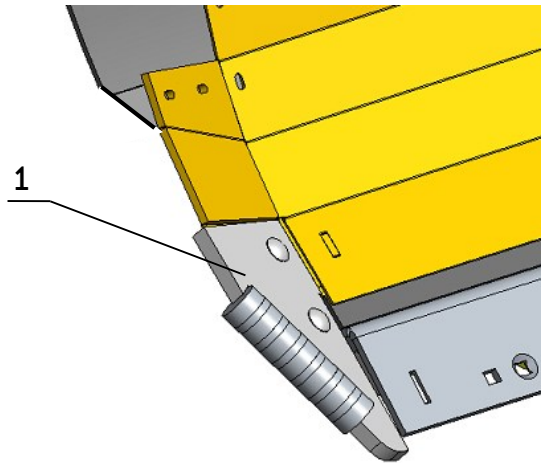
Drawing 1. Fastening of the blade holder

This plough type differs from ploughs made by other manufacturers by a special fastening method of the blade to the lifting frame (parallelogram). We use a spherical slide bearing, which ensures turning of the blade with a cylinder, as well as lateral tilting of the plough when the inclination of the road changes. For this purpose there is a **polyurethane** axle pad (1, Drawing 2) installed in the upper part of the rotation axle of the blade. This axle pad ensures tilting of the blade approximately two degrees in both directions during work, following the road profile and when lifted up the axle pad prevents excessive swinging of the blade. The axle pad also reduces vibration generated during the plough work.



Drawing 2. Rotation axle of the mouldboard

The plough blade is equipped with replaceable **side blades** (1, Drawing 3), which simplify cleaning of curbstones of the pavement. The edges of the side blades are reinforced with hard alloy coating round profiles, which ensure smooth, shock-free cleaning of curbstones.



Drawing 3. Side blade

MSP03 series is provided with **a hydraulic side impact protection mechanism** (7, Drawing 5), the function of which is to reduce shock impact on the blade tip in the event of contact with curbstones for instance. The impact protection mechanism enables elastic turning of the plough skirting for up to 3 degrees when the rotational cylinders' rods are at a distance of 50...100 mm from their extreme positions.

The plough is made of high-strength steel. For manufacturing the mouldboard, wear-resistant special steel is also used. The product is finished with high wear-resistant paint.

	MSP3703	MSP4003	MSP4603
Total width of cutting edges, mm	3660	3965	4575
Operation width of the blade in the condition of max. rotation angle, mm	2720	2970	3395
Total width of the plough blade, mm	4290	4600	5200
Height of the plough blade in the right edge (with cutting edges), mm	1400	1400	1400
Max. rotation angle of the blade (in both directions), mm	42°	42°	42°
Tilt angle of cutting edges in relation to the ground	50°	50°	50°
Total weight of the blade (excluding cutting edges and additional equipment), kg	985	1015	1065
Weight of the additional blade (including rubber cutting edges), kg	191	215	245
Recommended operating pressure of the hydraulic circuit, bar	160...200		
Recommended capacity of the hydraulic pump, l/min.	30...50		

Table 1. Technical specification of the plough**1.1. Standard equipment of a highway plough**

- Parallelogram (lifting frame of the plough)
- A mouldboard with two rotation cylinders and a lifting cylinder
- $\frac{3}{8}$ " hoses with $\frac{1}{2}$ " quick couplers
- Replaceable side blades
- Safety marking and LED side lights
- Colour: yellow, RAL 1007
- A hydraulic impact protection valve of the rotation cylinder with a hydraulic battery to reduce lateral impact

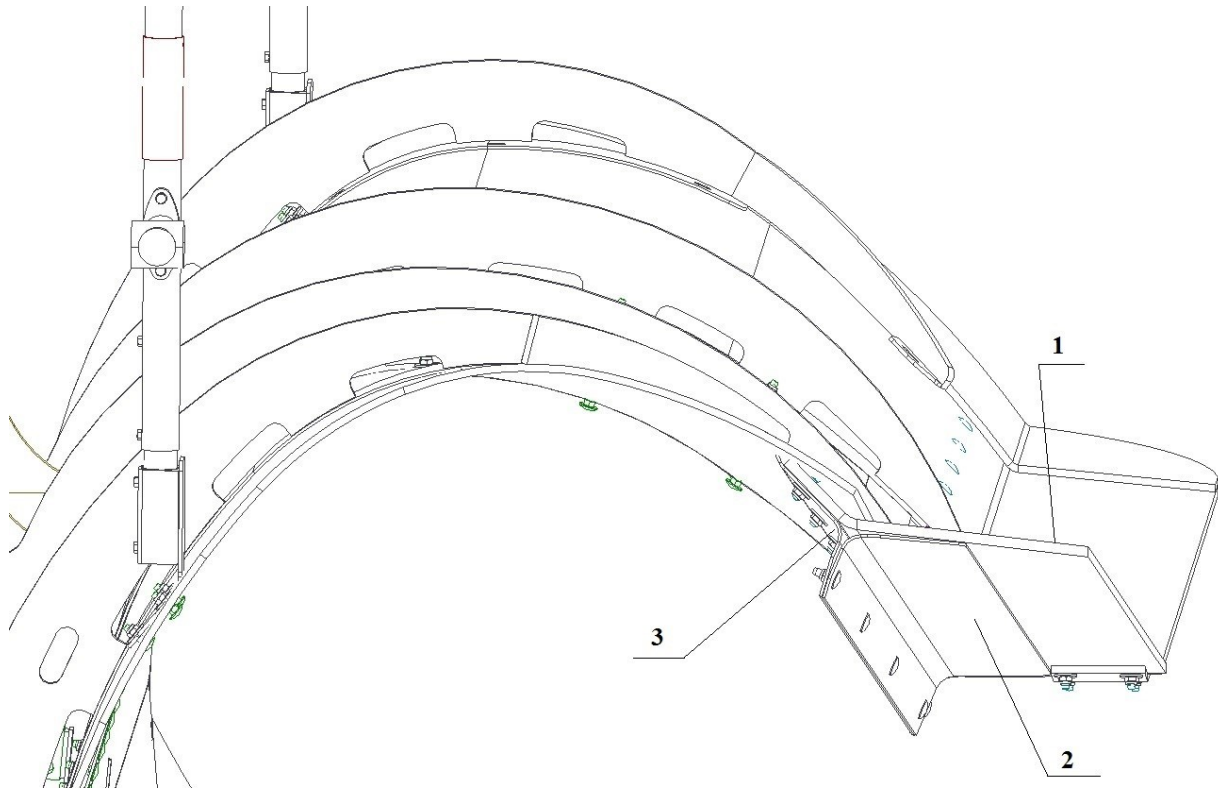
1.2. Additional equipment

- Hydraulic mechanism for the additional blade (possibility to adjust blade pressure applied on the road surface);
- A set of rubber blades (a special plough rubber with a thickness of 40 or 50 mm) for the additional blade;
- A support wheel including an adjustment mechanism, high-strength wheel, air tyre (the wheel cannot be mounted with an additional blade);
- A skid shoe with hard alloy plate and an adjustment mechanism;
- A set of steel blades with wedge bolts and wedges (made of hard alloy or as per customer's request);
- Electrical additional valve to control the additional blade (if the vehicle is not provided with three pairs of hydraulic outlets).
- Hydraulic support leg
- Side support roller
- Manometer (to adjust the pressure of additional blade)

NB! For the installation of an additional blade the vehicle must be equipped with three pairs of hydraulic outlets or an additional valve to control the additional blade!

2. PREPARATION OF THE SNOW PLOUGH BEFORE COMMISSIONING

A steel bracket [2] that is installed underneath the rubber strap [1, Drawing 4] at the front of the snow plough has been removed to reduce the dimensions of the snow plough during transport. Before commissioning the snow plough, this bracket has to be installed underneath the rubber strap. The bracket is attached to the angle [3] on the screen with bolts. The lower edges of two joined brackets should remain aligned, and the left screen should be as horizontal to the ground as possible.



Drawing 4. Screen

3. SAFETY REQUIREMENTS FOR OPERATING THE SNOW PLOUGH

Before operating the plough

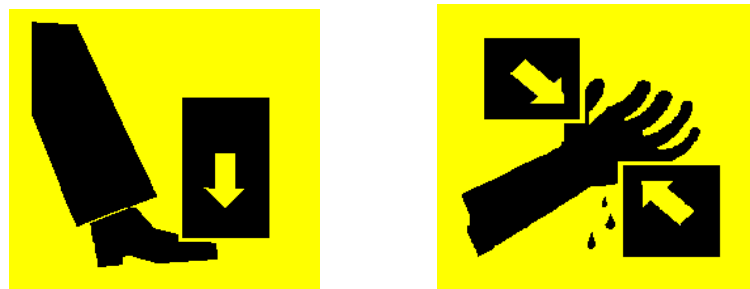
- Check that the plough set is complete and that it is in good operational order. It is forbidden to use equipment that is not in good operational order.
- Check that there are no people or objects near the plough, which could be injured or damaged by the plough. In addition safety of people carrying out maintenance of the plough, repairing the plough or moving the plough with the help of hydraulics or any other means has to be ensured. Neglecting of the safety requirements can cause injuries to people (the plough is provided with safety markings, see Drawing 5).
- It is forbidden to work under a plough that is lifted up and not supported.
- Check that the plough is properly fastened to the truck or tractor and that the fastenings are not damaged.
- Check that the safety markings, plough side lights (if provided) and reflectors are in good operational order.

- Check the operational order of cutting edges (if provided also the condition of slide feet or wheels); The cutting edges shall be adjusted, reversed or replaced latest when the distance between the cutting edge and the fastening openings is less than 26 mm;
- Check the condition of the fastening wedges of the blades;
- Check the condition of levers and fastening pins of the cylinders;
- Check that the hydraulic hoses are intact and properly fastened;
- Check that the plough is properly greased;
- Check that the plough has no damages.

Working with the snow plough

- To operate the plough the person shall be at least 18 years of age, shall have a driving licence of the appropriate category and shall have read through the operation instruction of the snow plough.
- Always pay attention to the surrounding and other traffic, including from the side roads and to the vehicles approaching from the rear. Pay attention to the pedestrians and cyclists not to cause them any risk when working with the snow plough. All warning lights must always be switched on during working!
- Follow the general traffic rules!
- The maximum permitted operation speed of the plough in normal road conditions is up to 70 km/h.
- Follow the weather conditions: when it is melting reduce the speed; when the snow is light pay attention to the wind direction and reduce the speed, if necessary.
- When working on soft ground reduce the speed, since the cutting edges may cut in the surface and you may lose control of the truck (or tractor) and the vehicle may run off the road. If the surface is soft support the plough with slide feet, wheels or an additional blade.
- The plough can only be used for removing loose snow! It is forbidden to use the plough for removing ice, frozen snowdrifts, rock, gravel, sand and other similar material.
- It is forbidden to remove the snow bank at maximum permitted full speed since this may damage the plough.
- It is forbidden to remove snow outside of road boundaries.
- In the event the highway plough is used in the city or on uneven roads where there is a risk of damaging the plough, vehicle or road surface, the user shall bear sole responsibility for such an activity. The manufacturer shall not be liable for any losses caused by the abovementioned activities.
- It is forbidden to attach such additional equipment on the moving parts of the plough that are not approved by the manufacturer.
- It is forbidden to use hydraulically operating equipment as a lifting jack.
- The plough may be lifted only from eye bolts.

Each time there is an incident during operation that could damage the equipment, an inspection of the equipment shall be arranged with the aim of detecting and evaluating possible damages. Damages (cracks in the structure or welded joints, deformed parts) may damage property and cause injuries. It is forbidden to continue work until the damages are repaired.



Drawing 5. Safety marking: ACCIDENT RISK!

4. MOUNTING AND DEMOUNTING OF A PLOUGH

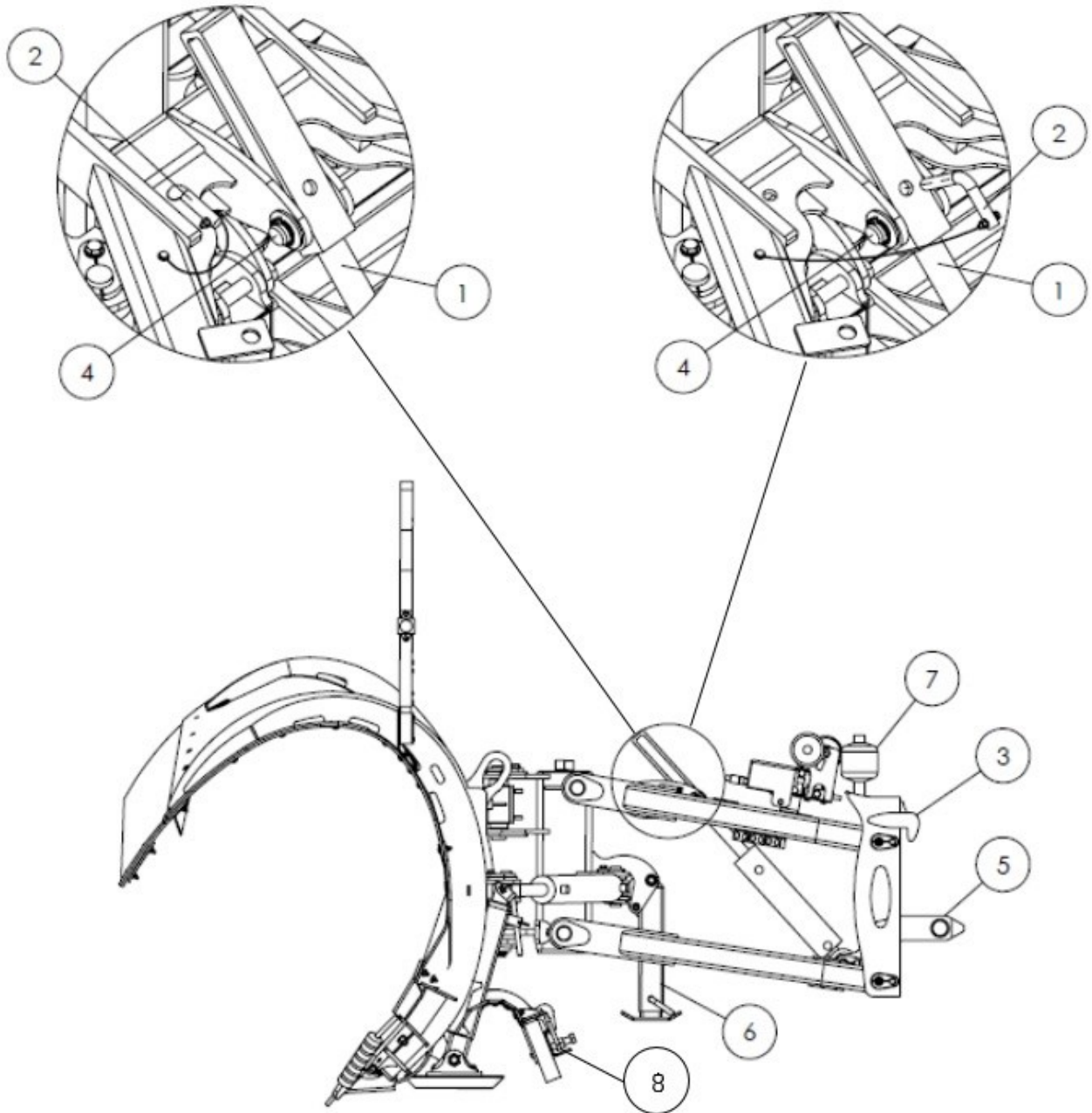
Mounting of a plough on the truck or tractor (Drawing 6)

- To mount the plough the vehicle must stand on a level surface.
- Drive the vehicle as close to the lifting frame of the plough as possible and connect the hydraulic hoses to the quick coupler of the vehicle.
- Lift the coupling frame of the plough to such a height that the fastening eyes (3) are over the upper edge of the coupling frame of the vehicle.
- Drive the frame of the vehicle against the frame of the plough and lift the plough with lifting cylinders onto the frame of the vehicle.
- Check that the fastening eyes (3) are correctly positioned and lock the frame (5) of the plough on the frame of the vehicle (as the locking systems of ploughs may differ depending on the country please follow the applicable requirements).
- Remove the pin (2) of the lifting cylinder and store it in a holder. Do not leave the pin attached to the cylinder during work! The pin should only be used to mount and demount the plough. If the pin is not removed for the work, the plough will not follow the uneven profile the road and the pin may break. You may leave the pin in place at your own responsibility only in the event the plough is equipped with a hydraulic floating system and the lifting cylinder does not press the plough against the ground.

Demounting of a plough from the truck or vehicle (Drawing 6)

- Install the pin (2) in the control surface opening of the lifting cylinder (1).
- Place the plough on an even ground, the cutting edge must rest on the ground and install the support leg (6) of the plough close to the ground (approx. 20-30 mm from the ground). If you install the support leg completely against the ground when you demount the blade, it is later more difficult to mount the blade on the vehicle (the fastening plate of the plough will be positioned too vertically).
- Loosen the fastening bolts or pins (5) of the frame of the vehicle.
- Lift up the frame (3) of the plough from the frame of the vehicle with the help of the lifting cylinder.
- Disconnect the hoses and drive further.

It is forbidden to lift up the plough with a pin, since the pin is not designed to support this heavy loads and it will bend through.



Drawing 6. Mounting and demounting of a plough (Finnish fastening system)

5. WORKING WITH THE PLOUGH

The plough is provided with a lifting cylinder (1, Drawing 6) giving the plough an option of a mechanically floating position. On the piston rod side of the cylinder there are control surfaces that enable the plough to move up and down (float) following the profile of the road surface. In order to ensure floatability the weight of the plough shall not fall on the lifting cylinder but the cylinder shall be in a retracted position and free during work.

Before starting work check the pressure of the tyre, if the machine is equipped with a support wheel. The pressure must be **10 bar**. In the event of sharp temperature changes the tyre pressure has to be re-checked.

It is very important to use proper working methods and not to overload the plough. For removing thick and heavy snow choose suitable (slow) speed and pay constant attention to the consistency of the snow. For removing wet snow and sleet make more use of the additional blade made of rubber. The pressure of the additional blade of the MSP series ploughs may only be adjusted when the front steel blade is in no contact

with the ground surface. Yet the additional plough may still get clogged when the front blades are too high up from the ground and the additional blade must remove all the snow. Do not use the additional blade on dry asphalt, since it may cause jerky movement of the plough and the additional blade may wear off too quickly.

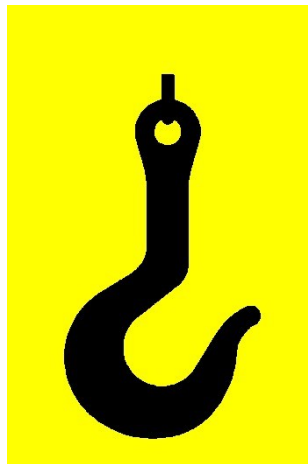
If your model is not equipped with support wheels we do not recommend using standard steel blades, since in contact with hard road surface they wear off too quickly. On ploughs without a support wheel and equipped with a rubber additional blade we recommend to use hard alloy blades, since these are more wear resistant. On models with support wheels and slide feet also standard steel blades may be used, if the weight of the plough does not fall on the blades.

It is not recommended to fully retract or extend the rotation cylinder during work. Approx. 100 mm has to be left for the cylinder travel. In this way it is possible to use the safety valve of the rotation cylinder to reduce more efficiently impacts of possible obstacles. If the plough is driven against an obstacle with a side, the rotation cylinder in the end position may damage the plough and the vehicle.

In case the plough is driven on a rigid obstacle, the fastening bolts (4, Drawing 1) of the blade holder may break, yet the structure itself will not get major damages and in most cases the plastic safety straps will keep the blade holder hanging on the blade.

5.1. Transporting the snow plough

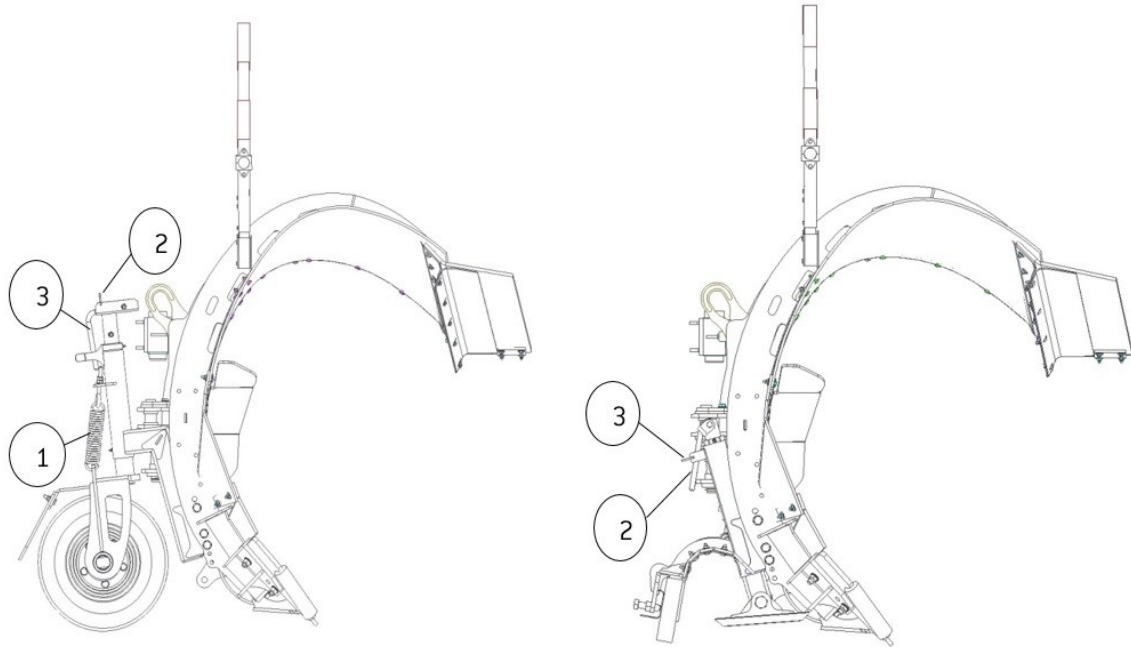
MSP03 series snow ploughs all have lifting eyes for transporting the plough marked with a corresponding marking (Drawing 7). In order to transport the plough in cargo or a container, first remove the screen (1, Drawing 4) to fit the plough into the cargo.



Drawing 7. Marking of the lifting eye

5.2. Usage of skid shoe and wheels

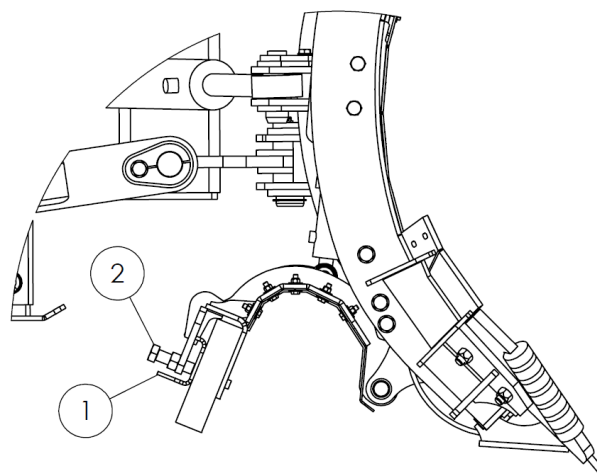
The wheel or skid shoe must be adjusted so that the steel cutting edge is 0-15 mm higher from the ground (depending on the road surface). The function of the wheel mechanism spring (1, drawing 8) is to pull the wheel closer to the blade when it is in the transport position. The tightness of the spring can be adjusted but the spring must not be this loose that the wheel gets in contact with the vehicle when the plough is lifted up. Regarding the skid shoe it has to be verified that it does not wear off too quickly since the foot may break and fall off. After adjustment of the wheel or skid shoe, do not forget to install the handle splint (2) to ensure that the wheel or foot remains in the desired position. Support wheels cannot be used with an additional blade.



Drawing 8. Usage of the wheel and the skid shoe

5.3. Working with an additional blade

MSP03 series snow ploughs may be equipped with a hydraulic blade (additional equipment), which gives better and cleaner ploughing result. In certain weather conditions (sleet and wet snow) it is only permitted to use an additional blade, whereas the front blade must be lifted up from the ground. The additional blade can be equipped with a rubber blade with the thickness of 40-50 mm and made of special rubber mix. To fasten the rubber blade the blade holder is provided with a fastening plate (1, Drawing 9): the rubber sheet is pressed on the fastening plate with bolts (2). When you use such fastening method there is no need to make bolt openings in the rubber blades. Compared to the products made by competitors, it takes much less time to replace the rubber blades of this type of a plough. It is also possible to lower the worn blade, which enables maximum use of the entire wearing material.



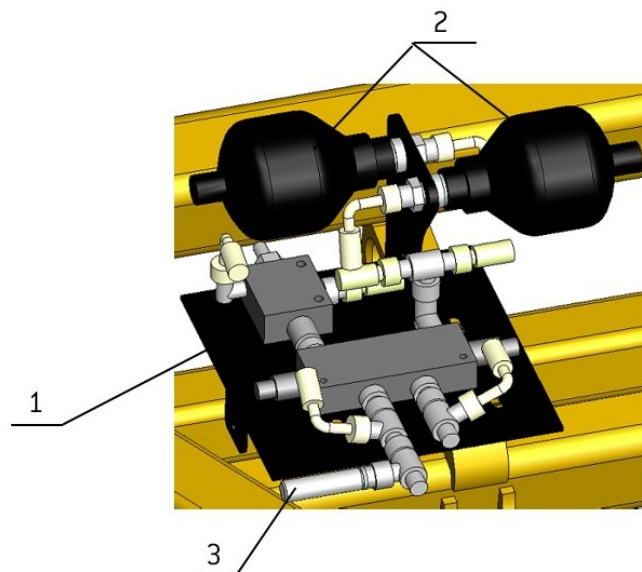
Drawing 9. Additional blade

Adjustment of working pressure of the additional blade

For installing a hydraulic additional blade LH, the vehicle must be equipped with three distributor sections (six quick coupler parts). The capacity of the hydraulic pump must not exceed 50 l/min., since otherwise the blade will move too fast up and down. With the help of hydraulic cylinders of the additional blade it is possible to lift up the pressure valve (1, Drawing 10) of the front blade.

Do not use the additional blade on dry asphalt, because this may cause the plough to spring and fast wear and tear of the additional blade!

To adjust the pressure remove the valve cap and adjust the pressure with an Allen by pressing at the same time the additional blade towards the ground (or to the lower end position). To increase the pressure in cylinders, turn the screw clockwise. The hydraulic system of the additional blade is equipped with two hydraulic batteries (2), which ensure flexibility of the additional blade in the desired pressure conditions. During adjusting you can use connection point (3) of the pressure gauge to measure the pressure. After flap adjustment the additional blade should be moved up and down to make sure it has been adjusted properly. Its optimal pressure on the ground surface is listed in the table below. The operating modes are recommended and they also depend on the road surface properties, amount of salt used, etc. The driver should select the operating modes taking into account the local conditions and personal work experience. When the road is uneven and plenty of salt is used, the pressure of the additional blade should be raised.



Drawing 10. Hydraulic unit of the additional blade.

Hydraulic system must be filled with hydraulic oil ISO VG 32.

Recommended additional blade operating modes

Weather conditions	Pressure of additional blade on ground surface, % compared to frontal blade	Operating pressure of additional blade, bar	
		MSP3703, MSP4003	MSP4603
Wet snow, snow layer 2-3 cm temperature range from -1 °C to +1 °C	100% (raise the frontal blade from the surface)	60-90	60-90
Wet snow, snow layer 4-5 cm temperature range from -1 °C to +1 °C	60-90%	30-45	30-45
Loose snow, 3-7 cm temperature range from -15° to 0°C	30-60%	20-35	20-35
Compacted snow, ice temperature range from -25° to 0°C	0%	0	0

When the additional blade's flap pressure (Drawing 11) is set to 60-90 bar, thus raising the frontal blade from the surface, the additional blade can be pressed down in a weaker manner, maintaining the contact of the frontal blade with the surface. The success of this depends on the driver's skills; it is not a precise operation and may not ensure the desired pressure distribution between the frontal and rear blades.

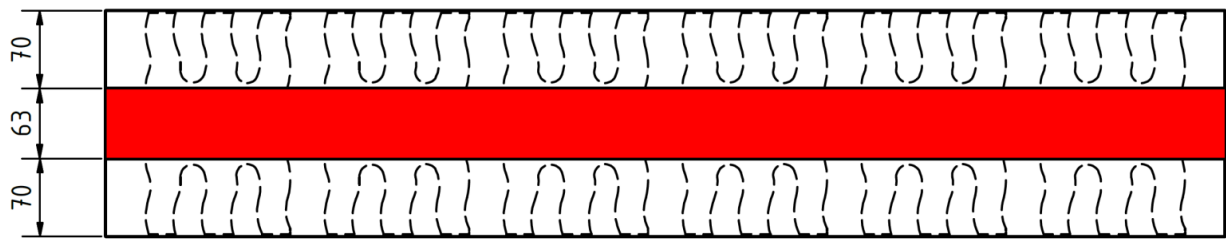


Drawing 11. Manometer

5.4. Description and use of Hardox rubber blades

Hardox rubber blades are highly durable rubber blades with Hardox metal reinforcement that withstand difficult conditions better than standard rubber blades and ensure significantly longer lifetime thanks to wear resistant metal. Hardox blade is suitable for use instead of rubber blade with all snow ploughs. Hardox rubber blade includes steel blade segments surrounded by rubber.

Hardox rubber blade can be used on both sides up to the red area marked on the blade. If one side of the blade is worn out up to the red area, turn the blade over and use the other side until it reaches the red area. Hardox rubber blade wear must not exceed the red line, i.e. 70 mm on both sides.

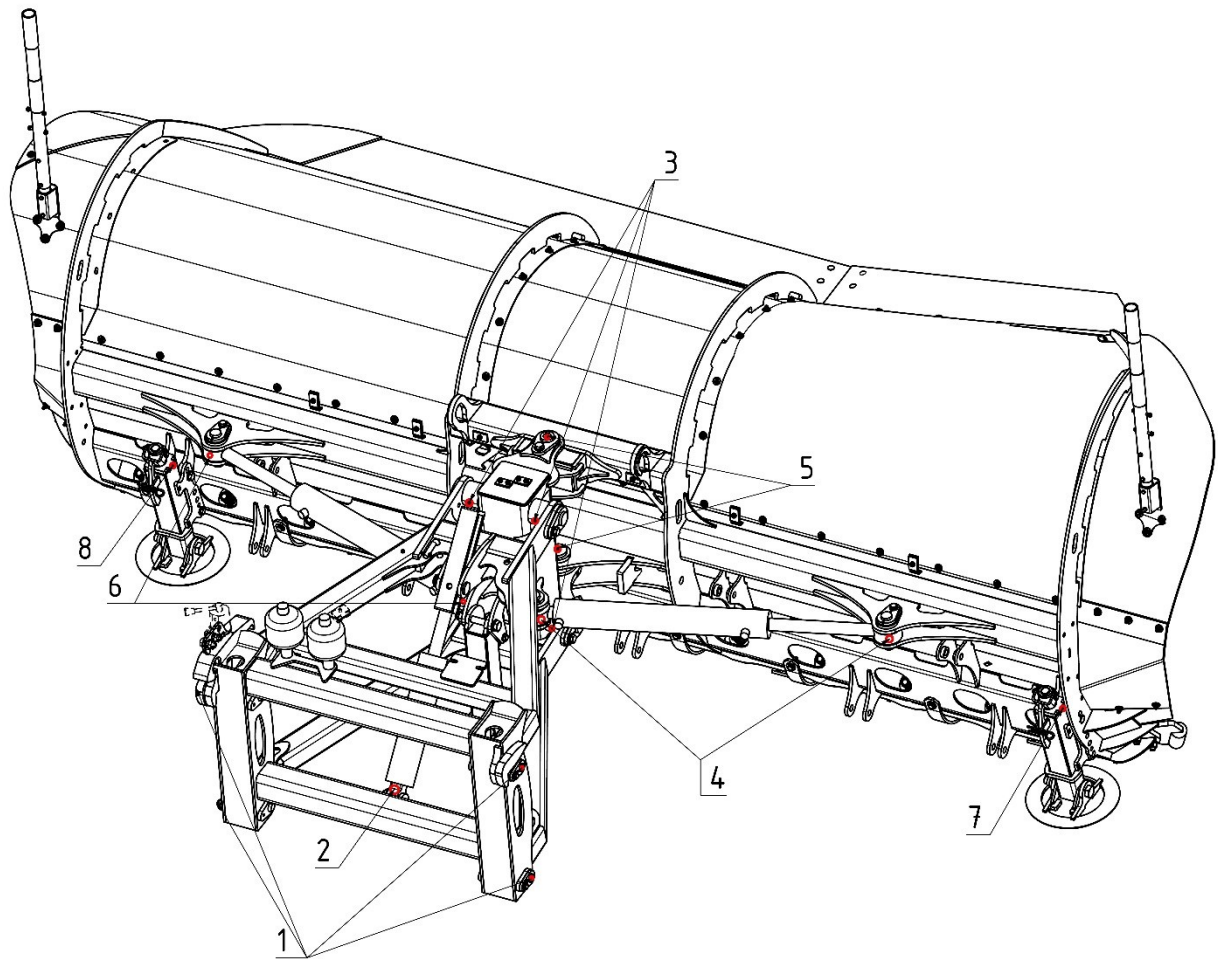


Drawing 12. Hardox rubber blades

6. MAINTENANCE OF THE SNOW PLOUGH

MAINTENANCE IN EVERY 8 WORKING HOURS	MAINTENANCE IN EVERY 150 WORKING HOURS	MAJOR SEASONAL MAINTENANCE
Check all bolt connections and hydraulic connections and tighten, if required.	Check all bolt connections and tighten, if required.	Check all bolt connections and tighten, if required.
If the plough is provided with wheels, check the bearing play of the wheels (see the spare parts catalogue, drawing 6). If the play is too big disassemble the wheel hub (10), check the bearings (30) and adjust the play (for adjusting use a nut (25) and a special locking washer (24) with pegs.	Check the condition of the fastening bolts of the blade holders. The bolt (4, drawing 1) torque must be approximately 60. Before tightening and controlling loosen the locknut.	Check that there are no leakages in the hydraulic system. If required, tighten the connections of the hydraulic parts and hose ends.
Check that there are no leakages in the hydraulic system. If required, tighten the connections of the hydraulic parts and hose ends.	Grease all grease points: bearings of the rotation and lifting cylinder of the blade, for Norwegian and Danish fastenings also the bearing of the coupling frame. If the plough is provided with slide feet and wheels grease the regulating mechanism.	Spray the zinc coated parts, hydraulic valves and hose ends with rust resistant wax.
Check the condition and fastening of the cutting edges. If required adjust the cutting edges or replace these.	Check the condition and fastening of cutting edges. If required adjust the cutting edges or replace these.	Grease all grease points. Also grease or wax the extended adjustment surfaces of the internal pipe of the wheel mechanism.
X	X	Check the plough visually and see if there are parts that need to be replaced.
X	X	Repair all paint damages.
X	X	Retract the piston rod of the cylinder and cover it with proper grease.
X	X	Store the plough in a place exposed to winds but protected from rain and UV-rays.

6.1. Grease points



Drawing 13. Grease points

Pos. nr	Location	Quantity
1	Midframe	4
2	Lift cylinder	1
3	Bearings of bracket	4
4	Rotation cylinder, roght	2
5	Main axle	2
6	Rotation cylinder, left	2
7	Skid shoe, right	1
8	Skid shoe, left	1
In all		17

7. WARRANTY CONDITIONS OF THE PRODUCT

- The Seller gives the Product a guarantee for a term of 12 (twelve) months. The guarantee term starts upon delivery of the Product to the Buyer and the time of delivery is the date indicated in the deed of delivery and receipt or CMR.
- The guarantee covers the elimination by the Seller of any production, material or construction defects detected in the Product or details thereof during the guarantee period. The Seller is obligated to replace the defective Product with a new one only if the repairing of the Product or a detail or replacing of a detail is not possible.
- The Buyer undertakes to inform the Seller in writing of any defects detected during the guarantee term within seven (7) calendar days as of learning of the defect, describing the defect in sufficient detail.
- The Seller is obligated to carry out an expert assessment to identify the causes of the defect within fourteen (14) working days after the receipt of the written notice. In the event of a defect covered by the guarantee the Seller eliminates it within twenty (20) working days after the expert assessment.
- The performance of repair work under the guarantee takes place at the delivery address specified in the Order Confirmation. Major repairs are made in the territory of the Seller. The cost of transportation of the Product to the place of guarantee repairs is borne by the Buyer. The Buyer bears the costs of repairs exceeding the terms and conditions of guarantee repairs and the transportation costs.
- The following defects are not covered by the guarantee:
 - defects arising from the natural wear and tear of the Product;
 - defects arising from the characteristics or damages of the road cover;
 - defects arising from the use of the Product in conflict with its technical conditions, security rules and purpose;
 - defects arising from disregarding the rules of maintenance of the Product;
 - defects arising from a traffic accident;
 - defects of which the Buyer has not informed the Seller in writing within seven (7) days as of the emergence of the defect and/or whereby the Buyer has not given the Seller the chance to identify the cause of the defect in accordance with the Agreement.
 - to the extent whose expansion the Buyer could have reasonably prevented.
- The Product guarantee term terminates before the prescribed time as of the time when:
 - the Product has been independently repaired, without coordinating it with the Seller in writing beforehand;
 - the constructions of the Product have been changed, additional equipment has and/or spare parts have been installed without coordinating it with the Seller in writing in advance.
- If the Seller, in spite of repeated written inquiries by the Buyer, fails to perform its guarantee obligations arising from the Agreement, the Buyer shall have the right to eliminate the Product's defect at the Seller's expense. The Buyer must inform the Seller in writing at least five (5) working days before the replacement or repairing of a defective Product and submit to the Seller a calculation of the presumable reasonable costs.
- The Buyer may withdraw from the Agreement and demand that the Product be taken back and the Purchase Price refunded only if the defect cannot be eliminate or the part cannot be replaced and if replacement of the defective Product with a new Product would not produce the results that would allow for the purposeful use of the Product.
- The Product or a part thereof replaced during the guarantee term is covered by the guarantee until the expiry of the overall guarantee term of the Product.